Calculus 1 Workbook Solutions

Economics

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MARGINAL COST, REVENUE, AND PROFIT

■ 1. A company manufactures and sells basketballs for $\$9.50$ each. The company has a fixed cost of $\$395$ per week and a variable cost of $\$2.75$ per basketball. The company can make up to 300 basketballs per week. Find the marginal cost, marginal revenue, and marginal profit, if the company makes 150 basketballs.

Solution:

The cost function is $C(x) = 395 + 2.75x$, where x is the number of basketballs, so marginal cost is $C'(x) = 2.75$, and $C'(150) = \$2.75$.

The revenue function is $R(x) = 9.50x$, where x is the number of basketballs, so marginal revenue is $R'(x) = 9.50$, and $R'(150) = \$9.50$.

The profit function is

$$P(x) = R(x) - C(x)$$

$$P(x) = 9.50x - (395 + 2.75x)$$

$$P(x) = 6.75x - 395$$

Marginal profit is $P'(x) = 6.75$, and $P'(150) = \$6.75$.

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■ 2. A company manufactures and sells high end folding tables for $\$250$ each. The company has a fixed cost of $\$3{,}000$ per week and variable costs of $85x + 150\sqrt{x}$, where x is the number of tables manufactured. The company can make up to 200 tables per week. Find the marginal cost, marginal revenue, and marginal profit, if the company makes 64 tables.

Solution:

The cost function is $C(x) = 3{,}000 + 85x + 150\sqrt{x}$, where x is the number of folding tables, so marginal cost is $C'(x) = 85 + 75/\sqrt{x}$, and $C'(64) = 85 + 75/\sqrt{64} = 85 + 9.375 = \$94.375$.

The revenue function is $R(x) = 250x$, where x is the number of folding tables, so marginal revenue is $R'(x) = 250$, and $R'(64) = \$250$.

The profit function is

$$P(x) = R(x) - C(x)$$

$$P(x) = 250x - (3{,}000 + 85x + 150\sqrt{x})$$

$$P(x) = 165x - 150\sqrt{x} - 3{,}000$$

Marginal profit is $P'(x) = 165 - 75/\sqrt{x}$, and

$$P'(64) = 165 - \frac{75}{\sqrt{64}}$$

$$P'(64) = 165 - 9.375$$

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$$P'(64) = \$155.63$$

■ 3. A company manufactures and sells electric food mixers for $\$150$ each. The company has a fixed cost of $\$7{,}800$ per week and variable costs of $24x + 0.04x^2$, where x is the number of mixers manufactured. The company can make up to 200 mixers per week. Find the marginal cost, marginal revenue, and marginal profit, if the company makes 75 mixers.

Solution:

The cost function is $C(x) = 7{,}800 + 24x + 0.04x^2$, where x is the number of food mixers, so marginal cost is $C'(x) = 24 + 0.08x$, and $C'(75) = 24 + 0.08(75) = \$30$.

The revenue function is $R(x) = 150x$, where x is the number of food mixers, so marginal revenue is $R'(x) = 150$, and $R'(75) = \$150$.

The profit function is

$$P(x) = R(x) - C(x)$$

$$P(x) = 150x - (7{,}800 + 24x + 0.04x^2)$$

$$P(x) = 126x - 0.04x^2 - 7{,}800$$

Marginal profit is $P'(x) = 126 - 0.08x$, and

$$P'(75) = 126 - 0.08(75)$$

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$$P'(75) = 126 - 6$$

$$P'(75) = \$120$$

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